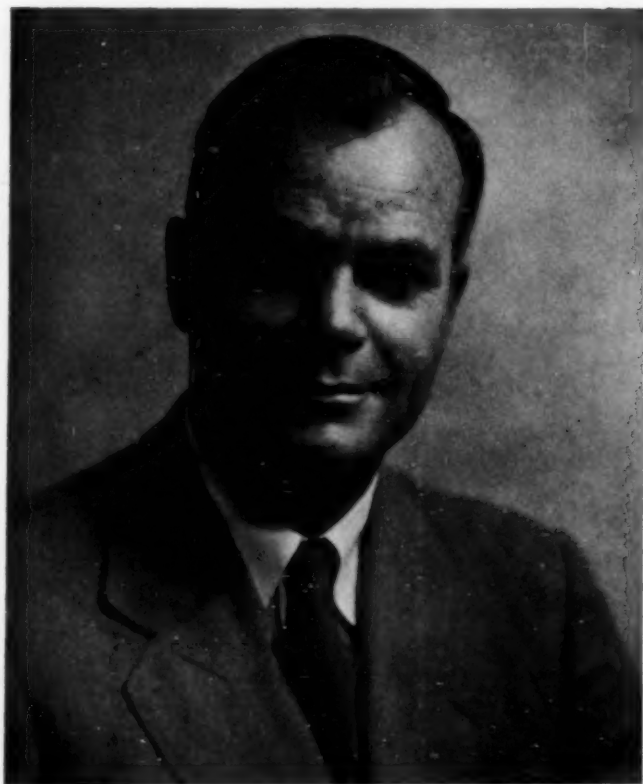


THE CHEMIST

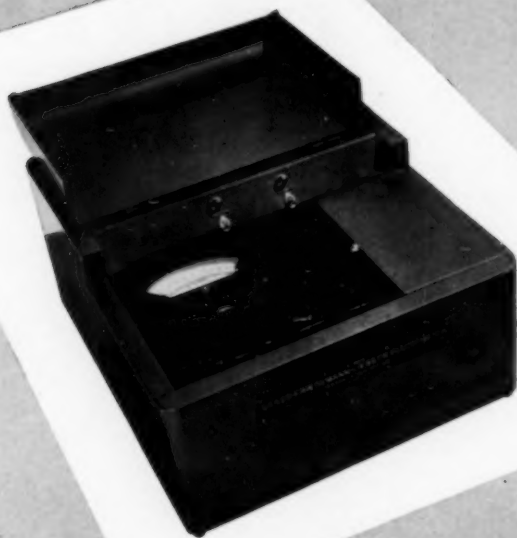
AUGUST 1951



VOLUME XXVIII No. 8



DR. H. G. THODE
Friendship Dinner Speaker
(See page 323)

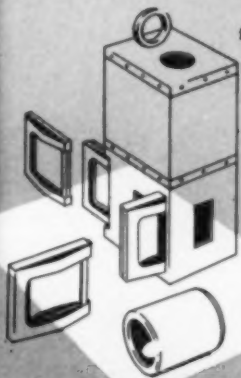


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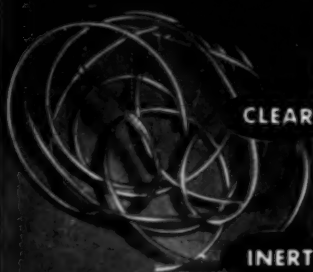
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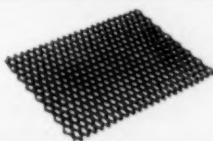
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60 East 42nd Street, New York 17, N. Y.

Volume XXVIII

August 1951

Number 8

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Entered as second class matter April 8, 1936, at the Post Office at New York, N.Y., under Act of August 24, 1912. Issued monthly at 60 East 42nd Street, New York 17, N. Y. Subscription price, \$2.00 a year to Members \$3.00 to Non-Members. Single copy, this issue \$0.25. Copyright, 1951 by THE AMERICAN INSTITUTE OF CHEMISTS, INC.

SCHEDULED FOR EARLY ISSUES

Annual Reports

When a Chemist Writes, Edward Thomas

Opportunities in Chemistry, Dr. M. J. Kelley, F.A.I.C.

Award of N.Y. Honor Scroll, to Dr. R. E. Kirk, F.A.I.C.

The Chemist as a Human Being, Dr. R. E. Kirk, F.A.I.C.

The Cooperative Spirit, Dr. Clyde E. Williams

Presentation of Ohio Award to Dr. Clyde E. Williams

IN THIS ISSUE

Editorials: Festivals—Chemistry—Peace,	
Dr. James R. Withrow, Hon. AIC	325
How Happy and How Big Do You Want to Be?	
Dr. Maurice J. Kelley, F.A.I.C.	326
AIC Friendship Dinner	327
To Receive Honorary AIC Membership, Dr. McKeen	328
Progress in Peroxides, Dr. Hans O. Kauffmann, F.A.I.C., and	
Frank A. Greenspan	329
Emulsion Paints, Donald A. Kohr, Jr., F.A.I.C.	337
Some Recent Developments in Testing Germicides,	
Dr. Emil G. Klarmann, F.A.I.C.	345
Committee on Patents, Supplemental Report	350
Committee on National Legislation Affecting Chemists,	
Annual Report	351
Council	354
AIC Activities	357
Student Medalists, 1951	357
Opportunities	360
For Your Library	361
Condensates	363
Professional Services	364

Cover Picture

Dr. H. G. Thode, F.C.I.C., president of The Chemical Institute of Canada, will speak at the AIC Friendship Dinner to be held September 11th. (See page 327).

Dr. Thode received the B.Sc. and M.Sc. degrees from the University of Saskatchewan, and the Ph.D. degree from the University of Chicago. He came to McMaster University in 1939 as assistant professor of chemistry, where he is now professor of chemistry and head of the department, director of research, and principal of Hamilton College. He was granted leave of absence from 1943 to 1945 to do war research with the National Research Council for which he received, in 1946, the M.B.E. for his contributions.

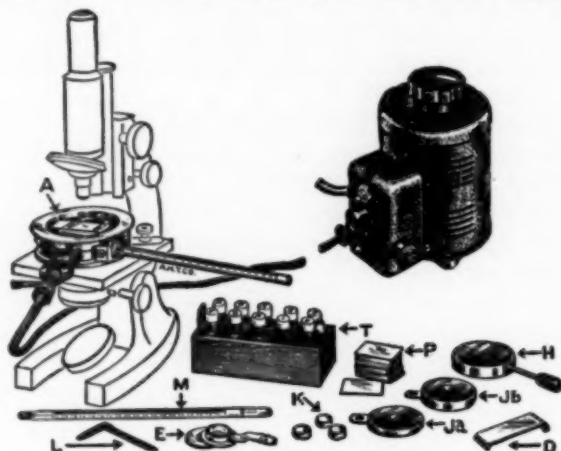
He is a Fellow of the Royal Society of Canada, and president of Section III for 1950-1951. He is a member of the American Chemical Society; the Rotary Club of Hamilton; and the Editorial Board of the *Canadian Journal of Research*. He is chairman of the Isotope Committee of Hamilton Medical Research Institute, Inc., and chairman of the Medical Committee of The Mountain Sanatorium at Hamilton. He is a Fellow of the Chemical Institute of Canada, first serving as vice president until he was elected president on June 19, 1951.

The Chemical Institute, with a membership of over 4000, is the only national organization of chemists and chemical engineers in Canada. Its objectives include the maintenance of all branches of the profession of chemistry and chemical engineering in their proper status among other learned and scientific professions; the availability for consultation by the government; the encouragement of original research, the development of high standards in the profession and of its usefulness to the public; the establishment of scholarships, medals, and prizes; and the dissemination of information, through lectures, meetings, exhibitions, classes, examinations, and conferences. The headquarters offices of the Institute are at 18 Rideau Street, Ottawa, Canada.

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EDITORIALS

Festivals—Chemistry—Peace

Dr. James R. Withrow, Hon. AIC

Professor Emeritus, Ohio State University

THE World will hardly know what a high spot in history the approaching Chemical Festival in New York may be. The Seventy-fifth Anniversary of the American Chemical Society; the Union of Pure and Applied Chemistry; the Congress of Pure and Applied Chemistry, constitute a well-managed sequence with a thousand papers.

Learned societies find it impossible to get papers for meetings. Chemists can never publish what they get from year to year. A student of my own, Crane, recently showed what a problem this makes for *Chemical Abstracts*. The caste-exclusiveness of the programs of learned societies deters scholarship productivity. Who can tell who or what will be important ten years from now?

This chemical productivity may be annoying in some ways but it speaks for a great profession. Chemistry is doing its part to break down caste in learning and is changing the retarded centuries into centuries of opportunity.

The achievements of chemistry are unquestioned but its greatest achievement is making men and women. This alchemy's closed-shop never did. A science or profession does just that. Its future is in the hands of individual research, book, and report writers—no guild of the Dark Ages

—publication for all. For publication, service, and production are the foundations of this profession, not scientific societies and universities, valuable as they are.

But let us not lead this profession astray. Spears and pruning hooks seem the first of completely reversible reactions. We got a bitter lesson at the previous Congress, in New York, of Pure and Applied Chemistry forty years ago, when the chemists of the world concluded that there could be no more war—chemistry was too effective and chemists too friendly. Within two years we were in World War I, and war gas. Romanticism had us by the gills.

It is more dangerous for our profession to be led astray now when we are face to face with the most dangerous nationalized philosophy the world has known, Marx-Leninism.

The chemical profession must be protected from this deadly philosophy. The end never justifies the means is the old Judae-Christian rule. With such a philosophy, we can personally never become Communistic and our profession can never be a public menace, but a true leader of youthful thinkers. The profession must be better because of us. Then we will amount to something, and not be parasites.

"How Happy and How Big Do You Want to Be?"

Dr. Maurice J. Kelley, F. A. I. C.

*Director, Industrial Development Laboratory, Nopco Chemical Company,
Harrison, N. J.*

THIS question captioned a recent advertisement addressed to creative men by a prominent chemical manufacturer. Even those who are not looking for a change of position should ponder this question from time to time. The well-considered answer will come pretty close to stating one's goal in life, and at the same time will reflect the principles which guide one's actions. For the chemist there should be, therefore, a relation to the objectives of THE AMERICAN INSTITUTE OF CHEMISTS and to its Code of Ethics.

The ideal chemist all of us would like to be might answer the question, "How happy and how big do you want to be?", as follows: "Let us answer the latter half of the question first: 'I want to be as big as my capabilities warrant—though actually such achievement is not nearly as important as several other things. Most important of all is that my every action reflect credit on the profession of chemistry. This requires, first and foremost, absolute intellectual and moral honesty. Truth is the greatest attribute of all existence. Those who flout it for seeming temporary ad-

vantage are a discredit to the profession, and will not be able to achieve the greatest happiness.

"Next, it is essential that I be a perfect gentleman, never causing another pain. More than that, I should always try to help my associates in every way that is consistent with these ideals, and with the duties and obligations entailed by my employment and the community in which I live and work. Of course, the duties and obligations must be discharged with strict fairness to all concerned, and with a desire to do more than my share to make the world a better place to live in.

"With all of this, I will strive constantly to improve my technical ability and overall knowledge and judgment, and will use all honorable means to rise to more important positions in my chosen profession. But I would rather not rise at all than to do so by unjust methods. While climbing the ladder of success, I will never push down a fellow chemist. It would be better to pause a while and help him to secure his grip, before I advance beyond him.

"In my work I will be most happy when my superiors are outstanding

examples of the above ideals, so that to one day follow in their footsteps is another way of expressing how big I want to be.

"I think it is becoming clear that the greatest happiness in any profession comes in constantly helping others to become better, and in enjoying the esteem of one's associates and contemporaries in the profession."



Chemistry and Astronomy:

Special program at Hayden Planetarium of the American Museum of Natural History, New York, N.Y., during week of 75th Diamond Jubilee meeting of the American Chemical Society and the International Congress of Pure and Applied Chemistry. Lecture on "Chemistry on a Cosmic Scale" will be given by S.I. Gale, Fellow of the Royal Astronomical Society of London, assisted by Dr. E. I. Stearns, and Robert R. Coles, on September 4th, 6th, and 7th, at 9 p.m.; 4 and 9 p.m.; and 11 a.m. respectively. The program is arranged by the American Cyanamid Company, and complimentary tickets may be obtained from the Calco Chemical Division of the company at Bound Brook, N.J.

Elected President: Dr. Herman W. Dorn, F.A.I.C., by the Frozen Food Institute, Inc., 90 West Broadway, New York, N.Y. Dr. Dorn is director of research for Irwin, Neisler & Company, Decatur, Illinois.

AIC Friendship Dinner

THE AMERICAN INSTITUTE OF CHEMISTS will make its contribution to better international relations with a "Friendship Dinner" to be held at the Hotel Commodore, 7:30 p.m., Tuesday, September 11, 1951, during the week of the International Congress of Pure and Applied Chemistry.

Dr. H. G. Thode, F.C.I.C., president of The Chemical Institute of Canada, will bring a message from our northern neighbors.

Prof. W. H. Linnell, senior vice president of the Royal Institute of Chemistry, will bring greetings from abroad.

This entirely informal dinner will be preceded by a "Friendly Hour" at 6:30 p.m., during which new friendships can be made and old ones renewed with the aid of cocktails. Visiting between tables will be encouraged.

Since attendance is limited to 250, members are asked to make advance reservations for themselves and their guests. Requests should be made to

Friendship Dinner

THE AMERICAN INSTITUTE OF CHEMISTS, 60 East 42nd St., New York 17, N. Y., with payment of \$6.50 per cover included. Reservations close September 7th.

To Receive Honorary AIC Membership

Dr. John E. McKeen, president, Charles Pfizer & Company, Inc., Brooklyn 6, N.Y., has been awarded Honorary Membership in THE AMERICAN INSTITUTE OF CHEMISTS, "for his vigorous and unselfish efforts in the advancement of chemical manufacture as an instrument to help and heal mankind."

The certificate of Honorary Membership will be presented to Dr. McKeen at a meeting of the New York AIC Chapter, to be held later. (Details will appear in following issues of THE CHEMIST.)

Testimonial Dinner To Dr. Alexander Silverman, Hon. AIC., June 13th, at the University of Pittsburgh. Two hundred chemistry alumni and friends honored Dr. Silverman, head of the University's Chemistry Department, who retired after forty-six years of service. The Department was established in 1875 by the late Dr. Francis Clifford Phillips. Over six-hundred B.S., M.S. and Ph.D. degrees have been conferred on chemists since that time, and there are 830 recorded published scientific papers, of which over 200 were by Dr. Silverman. Dr. John C. Fettermann, former professor and dean of the College, only surviving

member of the teaching faculty of Dr. Silverman's student days, spoke on "Silverman as a Student." Dr. Gilbert Thiessen, director of research of Koppers Company, who was in charge of arrangements, presented Dr. Silverman with a sizable check as a gift from his former students, and Prof. Baldwin, of the Chemistry Department, handed him a beautifully bound volume of over one-hundred testimonial letters from alumni.

The Spring issue of "Pitt", quarterly publication of the University, contains an elaborate collection of illustrated articles about the Chemistry Department since its founding, and a complete list of its publications.

Dr. Silverman will devote his future to research on glass and to writing in this special field.

Dr. Silverman was elected to Honorary membership in THE AMERICAN INSTITUTE OF CHEMISTS in 1951. (See March, 1951, THE CHEMIST.)

Visitors: About two-hundred and fifty young European and South-east Asian chemists and chemical engineers, who will attend the World Chemical Conclave in New York in September at the invitation of the American Chemical Society and under sponsorship of the Economic Cooperation Administration. A similar opportunity for sixty young chemists from non-ECA participating countries is provided through a grant by the Ford Foundation.

Progress in Peroxides

Dr. Hans O. Kauffmann, F.A.I.C. and Frank P. Greenspan

Buffalo Electro-Chemical Company, Inc., Buffalo 7, New York

(A slightly condensed version of a paper presented at the AIC Annual Meeting, May 11, 1951, as part of the Symposium, "Progress in Research.")

VERY few chemical compounds are known that show such a variety of interesting properties as hydrogen peroxide. This chemical which is generally considered the most important member of the widespread peroxide family has gained great importance in the past decade. Its properties have been thoroughly studied by a great number of investigators, who have thus laid the groundwork for its many applications in science and industry. In fact, hydrogen peroxide is a classical example of how intensive application research can create many new uses based upon a few basic properties.

In this paper we present a number of fields in which peroxides, particularly hydrogen peroxide, have gained in importance and grown in stature, and we show some of the more interesting applications.

I Oxidizing Properties

By far the largest number of peroxide uses are based on its oxidizing properties.

In terms of quantities of peroxides consumed industry-wise, bleaching has been and still is on top of the list. More items are now bleached with

peroxide, particularly hydrogen peroxide, than with any other bleaching agent, despite the fact that some bleaching agents are considerably cheaper than peroxide.

The main reason for the popularity of peroxides as bleaching agents resides in the following facts:

- (a) Peroxides are comparatively mild oxidizing agents and are not harmful to the material to be bleached.
- (b) Peroxides do not produce undesirable by-products.
- (c) Excess bleaching agent is generally not harmful and if advisable, may be easily removed.
- (d) Peroxide bleaching can be easily controlled.
- (e) Peroxide bleaching can be modified in many ways so as to make it adaptable to a great many conditions encountered in practice.

It is perhaps a recognition of this last fact that has contributed most to the development of new bleaching processes in recent years. These new processes have greatly simplified existent methods, reduced the overall bleaching cost and opened up a wider use of less expensive raw materials or intermediate products. The progress chart of peroxide bleaching of cotton shows that just before the last war, and especially after the war, the

curve took a sharp turn upwards. This was caused by the introduction of continuous bleaching processes. Studies of the rate of peroxide bleaching revealed that it is possible to bleach cotton in a very short time by applying a small amount of a more concentrated peroxide solution at higher temperatures. Formerly, it took many hours, sometimes days, to produce a satisfactory bleaching effect on cotton. The continuous peroxide process does the process in one to three hours,¹ requires less man hours, less steam and less floor space.

A field in which peroxides have gained great importance since World War II is the pulp and paper industry. Up to then, pulps were used either in the unbleached state for the production of paper and pulp products or were bleached by means of chlorine or hypochlorites. It was found that peroxides are much more effective in bleaching so-called groundwood pulp than any other agents previously investigated. For those who are not acquainted with that particular industry, I would like to point out that groundwood pulp is made by wet grinding of wood. The composition of the groundwood or mechanical pulps is practically identical with that of the wood itself. In contrast to groundwood, chemical pulps are made by digesting wood chips with chemical solutions with an inherent weight loss of 50% or more.

It has been the desire of the pulp

and paper industry for a long time to use the low cost groundwood pulp with its inherently valuable properties in higher cost papers. The low brightness of groundwood has been a deterrent for this purpose, but the development of commercially practical peroxide bleaching methods eliminated this disadvantage. Conservation of our natural resources and reducing of steam pollution gave additional impetus to this development. Cooperative research and development by paper mills and peroxide manufacturers has resulted in the adoption of peroxide bleaching of groundwood. Studies are now made to develop satisfactory and economical peroxide bleaching procedures for chemical pulps. Nowadays many commercial grades of paper contain peroxide bleached pulps, such as those in "Life", "Time", and "Readers Digest", to mention a few magazines, and such items as paper towels, paper napkins, etc.

A great number of diversified materials are now bleached with peroxides, such as oils, fats, waxes, soaps, feathers, hair, leather, marble, lecithin, woolens and furs, to mention only a few. The bleaching of wood surfaces has become quite an art.

Hydrogen peroxide has long been a widely used oxidant for laboratory work in organic synthesis. It is only in recent years, however, that large scale industrial utilization of hydrogen peroxide for organic oxidations

has occurred. In part, this is a reflection of several developments.

- (1) New and improved reactions utilizing hydrogen peroxide or peracids.
- (2) Advances in hydrogen peroxide manufacture leading to the commercial availability of pure and stable highly concentrated grades, e. g. 90% hydrogen peroxide.
- (3) The commercial introduction of peracetic acid, a particularly versatile oxidant.

Hydrogen peroxide's low equivalent weight and its reduction to water in oxidation reactions make it extremely attractive for organic oxidant use. The utilization of hydrogen peroxide, through the medium of a peracid, can most frequently be accomplished by an "in situ" technique wherein hydrogen peroxide is added to an acid solution of the substance to be oxidized. Peracid formation and utilization proceed apace.

It is convenient and practical for our purpose to discuss together hydrogen peroxide and the peracids. Let us examine at this point some of the more noteworthy reactions of hydrogen peroxide and/or peracids.

1. Epoxidation—Hydroxylation

Peracids react with unsaturated compounds to give oxirane (alpha-epoxy derivatives) and/or glycols.

The product formed is dependent upon the specific structure of the unsaturated material and the conditions under which the reaction is carried out. Since the epoxy ring is sensitive to ring opening, experimental condi-

tions for epoxidation necessitate low temperatures and the absence of strong acids.

The hydroxylation reaction is virtually a quantitative one; the epoxidation reaction only slightly less so. The unsaturated materials may be olefins (aliphatic and alicyclic), unsaturated fatty acids and esters, unsaturated alcohols, fats and oils, terpenes, unsaturated polymers, monomers, etc.

Epoxy compounds are of interest, (1) as reactive intermediates in organic synthesis, (2) as stabilizers for chlorinated polymers, (3) for production of new resins and surface active materials. The oxidation reaction is applicable to production of new long chain glycols, for the preparation of epoxy acids of interest for synthetic waxes, alkyd resins, lubricating greases, etc.

2. Dieldrin

One of the more recent large scale applications of epoxidation is in the production of a new epoxy insecticide, dieldrin.

The structure minus the epoxy ring is itself an excellent insecticide. The introduction of the epoxy ring in the 6, 7 position is reported to increase the insecticidal potency up to 4-fold, while reducing the vapor pressure to 1/25 of the previous. This results in high residual activity approximately equal to that of DDT.

3. 17-Hydroxysteroids

One of the more glamorous applications of epoxidation is in the production of 17-hydroxysteroids such as cortisone. Introduction of the 17 hydroxy group has proved to be one of the most difficult steps in the synthesis. Julian has described a procedure for the introduction of the 17 hydroxy group proceeding through an epoxidation at the 16-17 double bond of a dihydro starting material. . .

4. Quinone

Typical of quinone formation with hydrogen peroxide or peracids is the oxidation of substituted naphthalenes, such as the synthesis of 2-methyl 1,4-naphthoquinone, related to Vitamin K and of interest for its anti-hemorrhagic, bacterio-static and fungicidal activity.

5. Introduction of Hydroxy Group on a Steroid Ring

The oxidation of the ketones provides a novel method of introducing an hydroxy group onto a benzene ring and is much used in steroid work. Using acetophenone as an example, treatment with a peracid results in introduction of an oxygen between the carboxy group and the benzene ring. The resultant acetate is then readily hydrolyzed into the corresponding hydroxy compound.

6. Ring Splitting

One of the more unusual reactions of the peracid is a ring splitting ac-

tion on benzene rings. Treatment of Beta-naphthol with peracetic acid results in scission of one of the rings and formation in excellent yield of o-carboxycinnamic acid. Similarly phenol may be oxidized to the interesting conjugate dibasic acid, muconic acid.

The oxidizing action of hydrogen peroxide also finds many applications in inorganic chemistry. Objectionable metallic impurities in various metal salts are readily removed by precipitation after hydrogen peroxide treatment. Thus, where it is desirable to remove iron from a metallic salt, hydrogen peroxide treatment converts the iron to the ferric state, in which state it can be quantitatively separated as ferric hydroxide. This process finds application in purification of nickel plating solution, in the preparation of beryllium and magnesium from wet processed ores and in phosphatizing of steel, etc.

Percompounds have attracted interest for incorporation into dilute acids used for ore leaching (tungsten, molybdenum) whereby greater and more rapid solubilization of the desired metal is achieved. Addition of hydrogen peroxide to acids can be used to effect solubilization of metals which themselves are insoluble in these specific acids. Thus, metals such as mercury and iron, while insoluble in acetic acid, will dissolve in acetic acid containing hydrogen peroxide.

II Reducing Properties

Although hydrogen peroxide is best known as an oxidizing agent, it functions as a reducing agent in numerous reactions, for example with permanganate, dichromates, and ceric salts. Recent work of Taube and associates at the University of Chicago indicates that in such reactions all of the oxygen evolved is from the hydrogen peroxide. No transfer of oxygen from solvent or oxidizing agent occurs.

III Bactericidal & Fungicidal Properties

A dilute hydrogen peroxide solution has long been a First Aid standby of the average family. Recently, a solution of hydrogen peroxide in glycerine has attracted considerable attention as a germicide for various infections, particularly of the ear, nose and throat. Hydrogen peroxide dosage of milk was employed on a large scale in Europe during World War II, particularly in Italy.

Recent work has shown peracetic acid to be an excellent bactericide-fungicide. More important, the rate of killing action of peracetic acid against these organisms has been found to be very rapid. Comparative tests against a large number of quaternary ammonium compounds and high chlorine content germicides have shown peracetic acid to be the most effective of some 15 germicides tested against spore forming organisms of the flat sour type. Uniquely,

peracetic acid is a temporary germicide, breaking down on application to the surface into innocuous acetic acid and water. It has found application as a germicidal wash for fruits and vegetables and for equipment sanitizing. Dilute peracetic acid solutions sprayed on tomatoes in baskets enable one to maintain virtually static mold counts over prolonged holding and/or transportation periods.

IV Free Radicals Formation

Possibly the most unique property possessed by peroxygen compounds is their ability to form free radicals. Accordingly, peroxides find wide application in processes initiated by free radicals. These include polymerization reactions of the vinyl type, organic reactions proceeding through a free radical mechanism. Depolymerization reactions may also be considered in this category.

The use of peroxide as polymerization initiators is well known. A wide variety of peroxides have been employed, particularly organic peroxides such as benzoyl peroxide, cumene hydroperoxide. Our war time synthetic rubber program was built on persulfate initiated co-polymerization of butadiene and styrene. Possibly the most notable advance in peroxide catalysis of the last decade has been the development of redox or reduction activated polymerization systems. Various polyvalent metals, e.g. iron and copper, or reducing

agents, e.g. sugars and thiosulfate, used in conjunction with peroxygen compounds, have been found to greatly increase the rates of polymerization. Redox polymerization has made possible practical polymerization rates at low temperature. In the synthetic rubber field, this has led to so-called cold rubber possessing superior physical properties.

Many organic reactions of the free radical type can be catalyzed by peroxides. These include addition of polyhalogenated hydrocarbons, e.g. bromoform and the addition of H_2S , NH_3 , HCN to double bonds of an olefin.

Depolymerization reactions are similarly catalyzed by peroxides. Various polymers under the action of heat and a peroxide break down to lower polymers and monomers. These reactions find use in the recovery of monomers and lower polymers from plastic scrap.

In the presence of peroxides, polymers, such as starch, protein and cellulose, can be made to depolymerize. Treatment of a starch with a dilute solution of a peroxide (persulfate, hydrogen peroxide, peracetic acid) in the presence of a metal catalyst such as copper salt results in a depolymerization and production of a modified starch of lower viscosity and useful properties.

Depolymerization of cellulose can

be achieved by treatment of an alkali cellulose with a dilute hydrogen peroxide solution.

V High Heat of Decomposition & Reaction

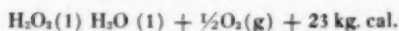
Decomposition products of inorganic peroxides are oxygen and water or salts, acids and alkalies. Organic peroxides decompose in various ways; their decomposition products are carbon monoxide, carbon dioxide, oxygen and a variety of organic compounds.

Decomposition of hydrogen peroxide has become of great importance since the last War when the Germans launched their "V" weapons. It played a very important role in the use of chemical propellants for the generation of power. The utilization of the energy produced by the decomposition of hydrogen peroxide was not seriously considered until practical ways and means were found to manufacture and handle concentrated hydrogen peroxide solutions.

The exothermic hydrogen peroxide decomposition reaction as such and the utilization of the formed oxygen for combustion of fuels forms the basis for the use of hydrogen peroxide as a source of energy. This energy can be released at a comparative slow rate to create mechanical propulsion or at a very high rate to create explosions.

PROGRESS IN PEROXIDES

The following table gives some interesting energy data.



Composition	Temperature °C	
	kg. cal./kg. (adiabatic)	
100% H_2O_2	690	1000
90% H_2O_2	615	750
11% Octane)	1830	2270
89% H_2O_2 90%)		

In this case, approximately 2/3 of the heat is derived from the combustion of the octane and 1/3 from the decomposition of the hydrogen peroxide.

It is well known that the Germans used hydrogen peroxide as such or in combination with fuels in launching or driving their "V" weapons, torpedoes, airplanes and submarines. In the submarine engine, water was used to reduce the combustion temperature from 4,000 to approximately 1000°F. The hydrogen peroxide catalyst chamber contained permanganate - impregnated porous stones.

Concentrated hydrogen peroxide forms explosive mixtures with a variety of combustible materials. Such mixtures are quite stable when left undisturbed but will detonate violently when subjected to mechanical impact or to a blasting cap. Such explosions may reach detonation velocities close to that of nitroglycerine. Substances which may be detonated in the presence of concentrated hydrogen peroxide are alcohols, aldehydes,

ketones, acids, esters, sugars and many others.

The heat formed from the decomposition of hydrogen peroxide can be utilized in cases where conventional heating methods are impractical or require primary sources of energy which is inaccessible. The rate of heat formation and the temperature desired may be obtained by controlling the rate of decomposition and the concentration of the hydrogen peroxide. It has been proposed for instance, to use such a system in cleaning out oil wells which have become plugged with paraffin.

VI Gas Formation on Decomposition

We have noted that one mole of hydrogen peroxide on decomposition gives rise to one mole of oxygen. Since this reaction can be made to occur at will, and since the only by-product of the decomposition is water, hydrogen peroxide is a convenient source of oxygen gas. Various techniques have been devised for employing hydrogen peroxide and its salts as a source of pure oxygen, e.g. for breathing apparatus. It is to be noted that oxygen so produced is sterile oxygen generated from a germicidal medium and of interest where sterile air is required.

Soil aeration by addition of hydrogen peroxide to a field has been reported to greatly increase agricultural crop yields.

The development of large volumes

of gas from a small volume of hydrogen peroxide (1 volume of 50% hydrogen peroxide gives 197 volumes of oxygen gas) has been utilized in unique procedures for preparation of porous products. Hydrogen peroxide plus a catalyst is incorporated into the product to be formed or made porous. The decomposition of the peroxide results in an "in situ" blowing of the material. A cross section of the product shows millions of air cells homogeneously dispersed throughout the medium. The density of the product is controlled by the amount of hydrogen peroxide added. Building materials, for example, gypsum, can be formed in this way to give light weight products of superior insulating properties.

Foam plastics and foam rubber can be similarly produced. Several processes employing hydrogen peroxide have been developed to produce foam rubber. Hydrogen peroxide is added to the formulated latex containing a catalyst. Decomposition of hydrogen peroxide sets in and the latex is foamed in place by the released oxygen. Products ranging in density from that of bus seats to that of very light pillows can be so produced.

In conclusion, progress made in its application has made peroxide an increasingly important factor in our daily lives—perhaps more than you may have realized.

National Meeting: The American Institute of Chemical Engineers, at the Sheraton Hotel, Rochester, N.Y., September 17, 18, and 19. Three symposia are scheduled, one on "Industrial Applications of Photography," another on "Chemical Plant Maintenance," and the third, "Round Table Discussion of Chemical Engineering Education." Plant trips will be arranged. The general chairman of the meeting is Albert K. Ackoff, 85 Ridge Road East, Rochester, N.Y.

Speaker: Louis N. Markwood, F.A.I.C., chief of Chemical Division, Office of International Trade, Department of Commerce, Washington, D. C., at the National Agricultural Chemicals Association meeting, Miami, Florida, April 4th, on "The National Production Authority and the Insecticide Industry;" at the Chemical Specialties Manufacturers Association meeting, Chicago, Illinois, April 30th, on "Latest Word from Washington," and at the Proprietary Association meeting, New York, N.Y., May 14th, on "Export Control in the Proprietary Field."

Nuclear Energy Symposium: At Oak Ridge, Tenn., from August 27th to September 7th. Open to all interested professional engineers. For details, write University Relations Division, Oak Ridge Institute of Nuclear Studies, P.O. Box 117, Oak Ridge, Tenn.

Emulsion Paints

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(Presented at the AIC Annual Meeting, May 10, 1951, as part of the Symposium on "Transforming Results of Research into Production.")

THE paint industry is an old one.

In this country it was literally born with the Republic. Back in those days paint making was an art. Knowledge was passed along from father to son, and it was not until the turn of the century that the chemist made his impact felt on our industry. As the years have passed, the industry has grown and the chemist has had his share in its growth. It is only fair to mention that even today the modern paint chemist still uses the developments of the artisans who formerly guided the technical destinies of the industry.

The paint industry has undergone several interesting technical revolutions in the past half-century. The development of phenolic resins gave the chemist-formulator a tool for increasing the speed of drying of paint films, as well as their durability. After World War I, lacquer came into being. Guncotton was reprocessed to produce a solvent-soluble resin, which made it possible to finish the products of our growing industrial machine with a speed that kept pace with that of their manufacture.

The lacquer development was closely followed by the introduction of titanium dioxide. This "white hope" of the pigment field developed slowly into today's giant. Its whiteness has brightened our lives far beyond the hopes of its originators. In the fabulous twenties, a resin which had been known for some time, became a reality as a result of the commercial production of phthalic anhydride. I refer to the well-known group of resins known as alkyds. Interesting enough, the alkyds were compatible with the previously mentioned phenolic resins, the nitrocellulose resins, and with that marvelous pigment, titanium dioxide. Like our country, the paint industry has been a melting pot which assimilated the chemical developments of industry, welcoming each new product as it came into being and fitting it into its proper niche.

Shortly after the development of alkyd resins, a hybrid finish came into being in Germany. The hybrid was the result of a cross between an alkyd-base finish and a water-base paint containing casein as the binder. This finish was called a resin-emulsion

base paint. Foreign developments have a way of focusing attention on unpublicized American developments which have been proceeding along a normal course. Such was the case with the alkyd-emulsion base finish. For sometime the paint industry had been improving the quality of casein paste paint by the addition of varying amounts of vegetable oils. The resultant emulsion binder improved the application, adhesion, and washability characteristics of the paints. The use of oil in these systems increased to the point where a casein paint became an oil emulsion paint, and a new product was born. During this development work, it was found that use of resin fortified oils or alkyds did a better job than oil alone, so the change from an oil emulsion to a resin emulsion was not an unexpected result. As so often happens in the paint industry, the newer product did not replace the older one; it merely broadened the market for finishes of both types.

Resin-emulsion Base Paints

Resin-emulsion base finishes made their debut in the late thirties and early in the fighting forties. The union of oil and water was formally recognized by the paint industry. Another technical revolution had taken place. Initially, the target of the paint industry, and in particular the company by which I am employed, was the production of a resin-emulsion paint that could be easily applied,

produce a finish that was pleasing to the eye, be of good durability, and have a suitable length of life. In addition, the product must have a reasonable cost, be of easy manufacture, and have a satisfactory package-life so that it could stay on the dealers' shelves for an indeterminate length of time, and be of good quality when sold and used.

An emulsion paint chemist has been described as an individual who carries a beaker of water in one hand, a paint brush or roller koater in the other, a note book, a slide rule, and a cake of soap in his pockets. He should have unlimited patience, and well-developed powers of observation, as in the emulsion paint field, progress is made only by not repeating the same formulative error more than twice.

Let us take a closer look at his activities in the laboratory. Even though there was a considerable technical background on the use of water in paint systems, hundreds of laboratory batches of emulsion paints were made, evaluated and tested. Raw materials had to be tested, and specifications established for their chemical and physical characteristics. Manufacturing procedures were worked out for the production of emulsion paints. Then the room testing program began. Initially the tests were made in the chemists' homes. There is no equivalent substitute for the comments of one's family as to the suitability of a finish. We lived with our

EMULSION PAINTS

early mistakes. Progress was slow and our management was patient. More than passing mention should be made of the favorable environment maintained by our Company for its chemists working on the development of emulsion-type finishes. Such an environment is necessary to satisfactorily carry a problem through to its logical conclusion. Over a three-year period, the research and development job was completed. Hundreds of room tests were behind us. The next step was to convince our sales executives that the finish was worthy of their marketing efforts. Here, again, we were most fortunate as our sales management gave us a critical—yet fair—appraisal of our development. Their approval of the finish after field tests and marketing surveys, started the ball rolling. Equipment for the manufacture of the product was designed and built. Raw materials were purchased and the manufacture of the product was begun.

The solution to the problem of developing a marketable resin-emulsion paint required the mutual efforts of the chemists employed in the chemical industry. To that group we express our thanks.

As mentioned, the paint industry is an old one, and why should a new product such as a resin-emulsion paint catch the public's eye? The resin-emulsion paint was easy to apply. Application equipment, such as brushes, roller koaters, and buckets, could be

cleaned up with soap and water. So could spills which had always haunted the amateur painter. The easy clean-up with soap and water removed the last barrier to feminine participation in solving the home decorating problems. An outstanding feature of emulsion paints is the good job that they will do over almost any type of interior wall surface. For the first time, it was possible to hide wall defects with a matte finish in a wide selection of attractive colors, chosen primarily for their decorative effect. The finish dried rapidly and there was no objectionable paint odor. It was an economical finish; a gallon of the paste paint, when reduced with water, made a gallon and a half of ready-to-use paint.

Millions of gallons of this finish were sold and used by millions of amateurs. The same is true today. Americans have learned to decorate for themselves.

Problems of the Paint Chemist

The paint chemist is motivated by a burning desire to produce a functional finish which can be easily applied, yet possesses both beauty and durability. This desire gets no place unless it is harnessed to (1) the raw materials available for the product; (2) the manufacturing; (3) the members of the manufacturing department who produce the product, process and equipment for the manufacture of the product; (4) the sales department who merchandise the

product, and (5) the people who buy and use the paint.

Like other research and development chemists, the paint chemist is always faced with the problem of developing a product which, when it leaves the factory, will work under a diversified set of conditions over which the chemist has no control other than the slim hope that the user will read the label instructions. I refer specifically to the manner in which the product is applied, the surface over which it is applied, and to the atmospheric conditions prevalent at the time of application. It is difficult to overcome the inhibitions which develop when faced with the thought that the paint product is accountable for only a fourth of the basic conditions which control the quality or outcome of the job.

Down through the years the paint chemist has learned, primarily through observation, to incorporate in his brain-child certain factors of safety which assure the user of obtaining the type of finish which was desired. Then, too, the paint chemist has the knowledge that his partner—the user of the product—is his collaborator in a mutual endeavor to beautify and protect a given surface.

In the Laboratory

Let us go back to the laboratory and take a quick look at what is going on in the emulsion paint field.

An emulsion paint is being put together. Water, the continuous phase,

is the basic ingredient. It can be said, with a minimum of poetic license, that if water is suitable for drinking, it is suitable for emulsion paint use. A few supplementary tests will give the answer, such as pH, bacteria count, and water-soluble salt content.

A protective colloid or colloids, water-soluble or water-dispersible, are incorporated in the water. The paint chemist can choose from a wide variety of products of animal, vegetable, or chemical origin. Animal proteins, such as casein, vegetable proteins derived from corn, castor, or soya; cellulose-base products such as methyl cellulose, carboxy methyl cellulose, or hydroxy ethyl cellulose; chemical products of the polyacrylate type, or styrene-maleic adducts, are often used as water phase components, either singly or in combinations to effect the desired protection at the water-oil interface.

Into the water phase go the preservatives, mildew inhibitors and stabilizers necessary to give the end product satisfactory package-and wall-life. The chemical industry has a large number of products suitable for this use, such as the various members of the phenol family and their chlorinated offspring.

Usually, though not necessarily, pigments are a part of the water phase. The pigments manufacturer has provided a wide selection of white and colored pigments suitable for emulsion paint usage.

EMULSION PAINTS

Titanium dioxide and the zinc sulfide family of pigments are the most commonly used white pigments. In cooperation with the producer of white pigments, certain standards of chemical and physical characteristics have been established for the respective members of the white pigment family.

Man does not live on bread alone, and likewise it would be a strange world, indeed, if the only color available was white, though the different tints of white are legion.

With the advent of resin-emulsion paints, color in paint came into its own. Hansa yellows, iron oxide yellows, and cadmium yellows are the more prominently used yellow pigments. Ultramarine and monastral blue have monopolized the blue field. The chromium pigments, monastral green, and the nitrose colors take care of the greens. The desire to go red is satisfied by the iron oxide, azo, and alizarine colors. The black side is taken care of by the iron oxide, and carbon black colors. In such a brief summary of suitable colors for emulsion paint usage, there is a good possibility that some acceptable colors have not been mentioned.

The white and colored pigments have been briefly mentioned. Another type, known for some strange reason as the "inerts", is an important part of the resin or latex-base emulsion paint. In this group are the dry or water ground micaceous silicates, china clays of

carefully controlled particle size, ground rock chemically known as the calcium carbonates, and the diatomaceous earth class, which includes the types which are chemically processed, and the naturally occurring ones which are either dry or water ground, and subsequently classified for particle size. So the pigment team in an emulsion paint consists of one or more white pigments, one or more colored pigments and one or more inert pigments.

About now, mention should be made of the surface active agents, or surfactants, used by the paint chemist in emulsion systems. Their function is legion, and differs with each type. Members of THE AMERICAN INSTITUTE OF CHEMISTS can take pride in the knowledge that their president has played a most important part in the development of this new branch of the chemical industry. The anionics and nonionics are the two most widely used types of surfactants.

The water, or continuous phase, has been briefly covered. The oil, or dispersed phase, has as its basic components one or more of the vegetable oils. The oil or oils are usually polymerized by heat or chemical treatment and are often re-enforced by resins also used in the production of the synthetic vehicles peculiar to the paint industry. The major requirement of the oil phase is that it can be readily emulsified and imparts a high

degree of water resistance to the final paint film.

One of the more interesting features of an emulsion paint is that the pigments usually ride in the aqueous phase until application, after which they tend to migrate into the oil phase as water evaporates from the film. Their migration is aided by the surface active agents contained in the paint.

This quick look over the chemist's shoulder, while he makes up an experimental batch of emulsion paint, gives a brief picture of the typical raw materials used in its formulation.

Latex-base Emulsion Finishes

Resin-emulsion base paints came into being in the forties. One section of the chemical industry was then devoting its efforts to the production of chemicals for the manufacture, as well as the production, of synthetic rubber to maintain our war and civilian economy. A whole industry was built overnight from plants to produce the raw materials for the program to plants that turned out the finished product.

After the war, the polymer chemist looked around for new fields to conquer, unsatisfied that our economy walks on rubber, rides on rubber, sits on rubber, sleeps on rubber, and wears rubber. The chemicals used in the production of synthetic rubber were juggled around in almost opposite proportion to those used in rubber latices, and a binder for paint

came into being, commonly known as a paint latex.

The paint industry was quick to accept this new chemical film-former and copolymer or latex-base paints began to appear on the American painting scene. The paint chemist, helped once again by his fellow chemists in the chemical industry, had taken several steps forward on the well-worn road towards a completely synthetic paint.

The knowledge gained in the formulation, manufacture and usage of millions of gallons of resin-emulsion base paint, made possible the rapid development of the latex-base emulsion finish.

As in the resin-emulsion base finish, water is the continuous phase, and the copolymer is the dispersed phase.

The water phase contains the hiding power, inert, and colored pigments. Proteins and other protective colloids, surfactants, preservatives, and mildew inhibitors are also dispersed in the water phase. The copolymer is supplied in emulsion form; consequently, a lesser amount of protective colloid is necessary to give the paint satisfactory package-stability and application characteristics than that used in the resin-emulsion base paint. With the advent of paint latices, it was possible to produce a ready-to-use finish that required only stirring before it was applied.

Let us again look over our shoulder; the latex-base paint has not replaced the resin-emulsion base paint,

EMULSION PAINTS

nor has the resin-emulsion base paint replaced the protein paste paint. There are places for all three in fulfilling the public's desire for economical decoration.

At the present time, most paint latices are styrene-butadiene copolymers, or plasticized styrene latices. Other types are now under test in the polymer chemists' laboratory, as well as in the paint laboratory, and when the present emergency ends, new types of latices will undoubtedly make their way into new emulsion paint products.

The paint latex took over the oil phase of the resin-emulsion base paint. A new product came into being: The latex-base emulsion paint. The latex development took less than two years to make from a standing start—that is, development of the latex to full scale commercial production. The emulsion paint branch of the paint industry was ready and waiting for this new product of the chemical industry.

Over the years, color has played an increasingly important part in our lives. A few years ago white and ivory were the dominant colors in an interior paint line. Color effects in a room were obtained from rugs, draperies, and upholstery fabrics. With the advent of resin-emulsion base finishes, the use of color on walls increased. This was due to the fact that color could be applied by the amateur, yet appear to be the work of a professional. The resin-emulsion

base paints did for the paint industry what the automatic transmission did for the automotive industry. Anyone could use them, just like anyone can drive a car with an automatic shift. This easy-to-use finish had another interesting characteristic. It was possible to obtain good color uniformity on a wall or ceiling. It was a partial solution to the color uniformity problem which has vexed the paint industry for years.

One of the major reasons for the rapid adoption of the styrene-butadiene latices as emulsion paint binders was that they imparted still more color uniformity to the paint film than did the resin-emulsion binder.

Color in Emulsion Paints

Twelve colors of a typical resin-emulsion base paint have had tremendous customer acceptance. Interior decorators and color stylists stated that the line was an adequate one for obtaining pleasing wall decoration. When looking at these colors, remember that they intensify in depth when room-applied. When these colors were introduced, the average wall color in a home was much less intense than those in the color fan.

A typical latex-emulsion paint color line has also twelve colors. Yet four of the colors are of tremendous depth when compared to the remainder of the line, as well as to those in the resin-emulsion line. Some of the colors used in the production of the respective paint colors were not available

when the resin-emulsion base finishes were introduced. Yet those that were available, were used, but not in the concentration as they can now be used in latex-emulsion base paints. The latex binder has the happy faculty of imparting outstanding color uniformity to a finish. Colors such as these have been available in enamel and semi-gloss finishes for years. But this is the first time they have been available in a wall finish that could be amateur-applied in an easy manner, free from the time-consuming precautions formerly necessary to obtain a good-looking deep color on a wall.

One might say of the paint chemist today that he is fast becoming the color chemist's best friend and customer. The increasing use of color in paints is a silent yet powerful, tribute to the men and women in the paint industries' decorative studios, who establish or interpret color trends, and in so doing, influence the selection of colors used in interior decoration.

When looking at the color lines of resin-emulsion and latex-emulsion paints, you probably could not notice the difference in sheen of the two types of emulsion finishes. The resin-emulsion base paint has a matte finish. It is a flat finish when viewed from any angle. The latex-emulsion paint has a flat appearance when the film is viewed head on, yet it has an agreeable angular sheen when viewed from the side. Styles change in the appear-

ance of wall finishes just as they do in other lines of business. The flat finish with the angular sheen is today's style leader. With this type of film-appearance or structure, it has been possible to take advantage of the latex copolymers' resistance to dirt and water, and build a finish that is truly a synthetic functional paint.

An effort has been made to sketch the path of an emulsion paint from laboratory to plant, and from distributor to user, and the results which the user obtained with this new type of product. I want to express my thanks to the chemists of the chemical industry who have developed the many different raw materials that the paint chemist uses in the formation of emulsion finishes.



Member of Board of Governors: Ralph Wechsler, F.A.I.C., treasurer of the Nopco Chemical Company, Harrison, N.J., who joined the Board of Governors of the American Financial and Development Corporation for Israel, established to direct and manage the sale of a \$500,000,000 Israel Bond Issue in this country. James G. McDonald, chairman of the Advisory Council, stated, "Israel's three-year economic development plan is based on a program of industrial and agricultural development not only to provide self-sufficiency for the present population, but to absorb an additional 600,000 new immigrants."

Some Recent Developments in Testing Germicides

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(Abstract of a paper presented at the AIC Annual Meeting, May 11, 1951, as part of the Symposium on "Progress in Research".)

THE question could be asked why the subject of testing germicides is being brought up for discussion before a group of chemists. Some might feel that such a subject could be handled more properly by bacteriologists or sanitarians or clinicians or others. The answer is that it is the chemist who either isolates or synthesizes the new antibacterial agents which are then turned over, usually to the bacteriologist or clinician, for testing or evaluation in terms of antibacterial capacity. It behooves the chemist, therefore, to understand the principles upon which the bacteriologist's report will be founded; obviously, such information will be the chemist's guide in his further endeavors to inquire into the possibility of preparing more effective products, possibly on the basis of the apparent relationships between the chemical constitution and antibacterial action of the compounds already prepared by him or by others.

By way of a delineation of the subject matter, this paper dealing with certain recent developments in

testing of disinfectants and antiseptics, concerns itself almost exclusively with the testing of chemical materials of synthetic origin, but not with chemotherapeutic agents, either of synthetic or of antibiotic character (e.g., sulfonamides, penicillin) except where indicated by direct relevance to the subject matter of this presentation.

The practice of combating the spread of infectious disease by means of disinfection and antiseptics has undergone considerable changes and refinements since the days of Pasteur, Lister and Koch. Synthetic chemistry was responsible, particularly in recent years, for an enormous expansion of the armamentarium of disinfectants and antiseptics. In addition to the chemical principles of antibacterial action, new physical means of producing this action have come into play, such as bactericidal short-wave radiations and supersonic oscillations. Special emphasis has been placed upon the so-called "air-sterilization" which utilizes either vapors or mists of certain glycols (also of other organic

and inorganic chemicals) as sources of antibacterial effectiveness.

It is the purpose of this paper to show that in several important respects testing methodology has not been keeping pace with the expansion in the several fields of antimicrobial agents and actions. Yet it is axiomatic that availability of proper testing methods should accompany any such development for the sake of a rational evaluation of the new products and processes; otherwise there is the everpresent risk of underestimating or, what is even worse, of overestimating their potential value. In this connection, it is a common weakness of human nature (of which even the scientific worker is not always free) to emphasize the advantages and to minimize the limitations of new discoveries.

With specific reference to developments in the fields under consideration, it may be said that there are probably two major reasons for the imbalance suggested above, *viz*:

(1) An apparent formalization of procedures, fostered by prolonged existence of so-called "official", albeit obsolete testing methods which enjoy quasi-legal sanction because they are being used routinely by certain regulatory and enforcement agencies.

(2) An insufficient regard for the existence, under practical conditions, of factors which affect antibacterial action; this is evidenced by an in-

adequate application of suitable and relevant modifications to *in vitro* testing methods, with the view to rendering their results more truly significant for the practices of disinfection and antisepsis, rather than permitting the products or processes under investigation to appear in an unrealistically favorable but deceptive light.

It would be impossible, of course, to describe thoroughly even the most significant developments in the testing of the different germicidal agents within the framework of this presentation; hence, the admittedly arbitrary selection of subjects to be discussed, with emphasis upon their broad aspects rather than upon any individual products or processes.

Limitations of the "Phenol Coefficient"

With reference to disinfectants, it is a matter of common knowledge that they are being tested routinely by the "phenol coefficient" method (known also as the F.D.A., or A.O. A.C. method.) This is an outgrowth of the old Rideal-Walker procedure; although both these procedures, and particularly their mathematical results *viz.*, the "phenol coefficients", are intended to apply only to substances chemically related to phenol, the literature, even that of the most recent past, is replete with references to the evaluation of disinfectants bearing no chemical or other relation to phenol whatever.

Moreover, it may be shown that in spite of the officially enforced so-called "safety factor" by which solutions recommended for practical disinfection are presumed to correspond in their bactericidal strength to a 5% phenol solution), it is entirely hazardous to "guess" at the anti-bacterial effect upon any given micro-organism from the known effect upon another, e.g., the test-organism *S. typhosa* employed in the F.D.A. or A.O.A.C. method.

Nor is the "phenol coefficient" informative with respect to the all important problem of the effect of organic matter (in its various forms) upon the anti-bacterial performance of disinfectants belonging to different categories. Thus some disinfectants, with high phenol coefficients, may suffer substantial or even almost complete inactivation in the presence of organic matter, while others, with lower phenol coefficients, may retain most of their effectiveness under the same conditions.

All this is deemed significant with respect to the increasing recognition of the role of the so called "secondary reservoirs" of respiratory infection, and of the position of germicides in their control. Although it has been known for quite some time that respiratory diseases, like the food-borne ones, could be spread by direct contact (e.g., by kissing), or indirectly (e.g., by contaminated hands, infected instruments or other material ob-

jects) it is only in the comparatively recent past that the contamination with pathogenic organisms of enclosed spaces has begun to receive concentrated attention. It is now conceded that in connection with the transmission of disease via the aerial route, one has to consider not only the possibility of infection by droplets expelled by some form of forced respiratory action (e.g., sneezing or coughing), but also that by contaminated dust on the floors and on other surfaces. The latter represent the "secondary reservoirs" of sedimented infective particles; they may be re-suspended in the air by some form of mechanical activity (e.g., sweeping), and thus become a potential source of infection when alighting upon the mucous membranes, the conjunctiva, the open wound, etc. of the host.

The most important microorganisms to be considered in this connection are hemolytic streptococci, pneumococci, staphylococci, tubercle bacilli, and influenza virus. While it is essential to know whether a given disinfectant product or process may be counted upon to suppress the risk of infection by these infective agents, as furnished by the secondary reservoirs, the "official" testing methods will not supply an answer to this question. The test-organism specified, viz, *S. typhosa* is not at all representative of the microorganisms involved in the spread of respiratory disease; besides, there is the inherent inability

of this testing method to give a realistic comparative appraisal of the different available disinfectants even with respect to *S. typhosa* alone. As a consequence, no valid conclusion can be drawn from the results of the test as to whether or not any given germicide, or any given dilution of it, may be relied upon to destroy the infectious microorganisms whose elimination is being aimed at as a measure of prevention of the spread of respiratory infection.

Limitations of Tests of Antiseptics

In the field of antiseptics (intended for use on the body or in body cavities) there is the need, too, for breaking away from formalized testing procedures, and for determining the merits of the individual preparations on the basis of their performance in practice, or in tests which adequately approach the conditions of practical usage. Here, too, the routine tests by the F.D.A. (A.O.A.C.) method are not likely to be wholly informative; however, it should be added, at this point, that the authors of the F.D.A. method were aware of the inability of any laboratory test to duplicate the conditions of practice, and that the several procedures constituting parts of this method were intended primarily to eliminate the obviously inactive or useless preparations.

What has been said about the inactivating influence of organic matter upon the function of disinfectants

applies equally strongly in the case of antiseptics. Another factor to which insufficient attention has been paid is the reversibility of antiseptic action. This phenomenon has been observed in a number of instances of which the following are deemed more significant:

(1) Desorption and elution of adsorbed antibacterial agents.

Examples:

(a) restoration of viability of mercuric chloride treated bacterial spores by subsequent exposure to activated carbon acting as a competitive adsorbant,

(b) elution of adsorbed cationic material from spores by mechanical washing.

(2) Inactivation of mercurials and of other metallic compounds by thiols. Example: Restoration of viability of certain pathogens, originally inhibited by organic mercurials, through contact with thiol bearing substances (e.g., thioglycolate), also with biological materials such as blood.

(3) Modification of the action of antiseptic dyes by pH variation. Example: Revival of bacteria originally treated with a basic or an acid dye, through the required change of pH.

(4) Reaction between cationic antiseptics and phospholipids. Example: Partial inactivation of quaternary ammonium compounds by lecithin.

(5) Antagonism between sulfonamides and para-aminobenzoic acid (and related substances). Example: Inactivation of the bacteriostatic action of sulfanilamide by p-aminobenzoic acid, p-hydroxy-aminobenzoic acid and novocain.

(6) Antagonism between metabolites and their analogs. Example: Reversal by valine (alpha-amino-iso valeric acid) of the inhibiting action of alpha-amino-isobutane sulfonic acid.

Conclusion

With all this information adduced as evidence, it is held that the research chemist who ventures into the

borderline area between chemistry and bacteriology (including chemotherapy) should consider critically the advantages as well as the pitfalls of existing testing procedures, no matter how well sponsored. He should guard particularly against easy but faulty generalizations derived from inadequately controlled or improperly digested bacteriological or clinical reports rendered upon the performance of the products of his research activity.



S C I Elections

Dr. Robert C. Swain, F.A.I.C., vice president in charge of research and development, American Cyanamid Company, New York, N.Y., was elected honorary chairman of the American Section of the Society of Chemical Industry for 1951-1952, as announced by Dr. Gustavus J. Esselen, Hon AIC, retiring honorary chairman.

Other officers elected were Honorary vice chairman, Harry B. McClure, F.A.I.C., vice president, Carbide and Carbon Chemicals Corporation; honorary treasurer, Dr. Cecil L. Brown, F.A.I.C., assistant director of research, Standard Oil Development Company; honorary Comptroller, Robert Heggie, director of research, American Chicle Company; and honorary secretary, Dr. Frederick W. Adams, F.A.I.C., director of research, Spool Cotton Company. Members of

the Executive Committee elected for three years are: Dr. Bradley Dewey, Jr., F.A.I.C., Dewey & Almy Chemical Company, Cambridge, Mass; Ray P. Dinsmore, F.A.I.C., Goodyear Tire & Rubber Company, Akron, Ohio; W. W. Duecker, Texas Gulf Sulphur Company, New York, N.Y., and Alex Stewart, National Lead Company, New York, N.Y.

Others who continue members of the Executive Committee are: Dr. L. W. Bass, F.A.I.C., U.S. Industrial Chemical Company; J. L. Bennett, Hercules Powder Company; Dr. Gustavus J. Esselen, Hon. AIC, U.S. Testing Company; Lawrence H. Flett, President AIC, National Aniline Division, Allied Chemical & Dye Corporation; Dr. L. B. Hitchcock, F.A.I.C., National Dairies Research Corporation; G. E. Holbrook, E. I. du Pont de Nemours & Company; Dr. R. T. Major, F.A.I.C., Merck & Company; R. L. Murray, F.A.I.C., Hooker Electrochemical Company, and Dr. C. F. Rassweiler, F.A.I.C., Johns-Manville Company.

Instrument Conference: Of the Scientific Apparatus Makers Association, September 10th to 15th, Sam Houston Coliseum, Houston, Texas. The SAMA Luncheon, featuring "Instrumentation in Petroleum Refining," by James Harrop, Humble Oil & Refining Co., will be held September 12th at the Rice Hotel.

Committee on Patents

Supplemental Report May 1951

I WISH to supplement my report of September 8, 1950, with the following information concerning bills introduced in the Senate and House of Representatives.

S. 868 (Johnson):

The Johnson bill, designed to establish a clearing house in the Department of Commerce for the dissemination of technical information to American business, became Public Law 776, 81st Congress, on September 9, 1950.

H. R. 323 (Reed):

The Reed bill, introduced in the House on January 3, 1951, and referred to The Committee on the Judiciary (similar legislation, H.R. 9366 and H.R. 8884, was introduced in the 81st Congress but received no action) is designed to provide for the extension of the term of any patent for a period commensurate with the period in which the normal use of the patent was prevented or delayed by the granting of a royalty-free or nominal-royalty license to the government, or restrictions imposed by the United States by reason of war or other national emergency, etc.

H. R. 9133 (81st Congress):

As previously reported, no hear-

ings were held on this codification bill (to revise and codify the laws relating to Patents and the Patent Office) during the 81st Congress. A corresponding bill is expected to be introduced during the present session of Congress, and hearings with respect to the bill will be held in May.

H. R. 2257 (Celler):

The Celler bill, corresponding to the Royalty Adjustment Act of 1942, which was passed solely as a wartime measure, is proposed to incorporate similar provisions into the law as a permanent measure applicable in peacetime as well as in wartime. In substance, the bill provides that whenever an invention is licensed to, or is manufactured for the government, the express provisions of the contract may be set aside by a governmental employee insofar as the royalty to be paid is concerned. There seems to be no justification for such a measure in ordinary times, and there further seems to be no justification for singling out patents as distinct from other property.

Progress on the various bills referred to above will be submitted in your Committee's next report.

—Anthony William Deller,
Chairman

Committee on National Legislation Affecting Chemists

Annual Report May 1951

SIGNIFICANT events affecting chemists have occurred on the National scene during the past year. The National Science Foundation became a reality; the National Production Authority was created to cope with problems arising from the current emergency; and progress is noted in the Synthetic Fuels program.

National Science Foundation

The National Science Foundation, about which many words have been written, came into being with the President's approval on May 10, 1950, of Public Law 507. Upon recommendation of an Advisory Board, the President on March 9, 1951, nominated as director, Alan T. Waterman, chief scientist and deputy chief of the Office of Naval Research. Dr. Waterman had previously taught physics at Yale for twenty-seven years. He was one of a group of seven scientists suggested for the post by the Advisory Board, and his appointment is yet to be confirmed by the Senate. Twenty-four board members of the Foundation have also been appointed and are now awaiting Senate confirmation.

The law contains an extensive section on security provisions, including requirements for loyalty oaths from

recipients of scholarships and fellowships. Appropriations are not to exceed \$500,000 for the fiscal year ending June 30, 1951, nor \$15 million for each year thereafter.

The course of the National Science Foundation will be followed with much interest. It can set a pace for research hitherto unmatched. One aspect that should shortly be clarified is its relationship to the Research and Development Board of the Department of Defense.

National Production Authority

The Defense Production Act of 1950, approved September 8, 1950, created the National Production Authority as the instrument for promoting maximum production of goods for defense purposes and essential civilian needs. Industry is now subject to regulations of National Production Authority, which already is staffed with a sizable body of employees and is well on the way toward repeating the performance of the War Production Board of World War II.

National Production Authority was fashioned from the Office of Industry and Commerce of the U. S. Department of Commerce. It may split off as an independent agency as

it grows in size and in scope of operations. The Chemical Division is one of the important operating units.

Shortages of numerous chemicals have tested the abilities of this group in eliminating bottlenecks in production. So far no chemicals have been made subject to allocation but the nature of the problem is such that allocation of certain basic chemicals can hardly be avoided. Allocation provides the method for channeling short-supply materials according to essentiality of end-use. Sulfuric acid and sulfur loom as two critical items of such importance that they appear to be among the first that will be allocated.

Synthetic Fuels

Funds available to the Bureau of Mines for research on synthetic fuels have been increased by \$27,600,000 in public law 812 of the 81st Congress, which was approved by the President, September 22, 1950. The Bureau of Mines program is extended to April 1955. A total of \$87,600,000 has thus been made available for this work. Of the sum last authorized, \$2,600,000 is to be used for an experiment station in or near Morgantown, West Virginia.

There are three bills now in Congress directed to promoting the commercial production of synthetic liquid fuels. S. 6, introduced January 8, 1951, by Senator McCarran was referred to the Committee on Interior and Insular affairs; H. R. 1316, in-

troduced January 12, 1951, by Rep. Wolverton is before the Committee on Interstate and Foreign Commerce; and H. R. 279, introduced January 3, 1951, by Rep. Ramsay, was referred to the Committee on Banking and Currency.

S. 6, and H. R. 1316 are virtually counterparts. They both provide for RFC financing of privately-owned and operated synthetic liquid fuel plants of capacities not less than 5,000 barrels a day. Both define synthetic liquid fuel as "a liquid fuel and any intermediate gaseous products produced from coal, oil shale, and other substances except petroleum, and, for the purposes . . . of this act, except natural gas." The Secretary of the Interior is authorized to construct and operate plants if, in his judgment, private industry is not making adequate provision for synthetic liquid fuel production. The bills differ in that the Senate bill allows outstanding loans of \$650 million while the House bill specifies that the amount shall not exceed \$350 million.

H. R. 279 is directed to promoting the stockpiling of synthetic liquid fuels. In this bill, synthetic liquid fuel means a liquid fuel and any intermediates, or gaseous products produced from coal. Besides authorizing the stockpiling of synthetic fuels, it authorizes the National Securities Resources Board to place any synthetic liquid fuel plants in standby condition when not needed or to dis-

COMMITTEE ON . . . LEGISLATION

pose of such plants under the Surplus Property Act of 1944. No definite sum is specified to carry out the purposes of the act.

—L. N. Markwood, *Chairman*
Gustav Egloff
Eduard Farber

Associate Editor: Dr. Eduard Farber, F.A.I.C., chief chemist, Timber Engineering Company, Washington, D.C., who has been appointed to the Editorial Board of *Isis*, the official journal of the History of Science Society, as associate editor for chemistry.

In Charge of Polymer Course:

Dr. Herman F. Mark, F.A.I.C., director of the Institute of Polymer Research, Polytechnic Institute of Brooklyn, who is directing the summer course on "Determination of Molecular Weight and Shape of Polymers in Solution."

Representatives: Drs. Stewart J. Lloyd, F.A.I.C., and George D. Palmer, F.A.I.C., both of the University of Alabama, will represent the Southern Association of Science and Industry in planning for the South-wide Chemical Conference, scheduled to be held in October, 1951, at Willson Dam, Alabama.

Elected: By the Electrochemical Society, Inc., Ralph M. Hunter as president, and Marvin J. Udy, F.A.I.C., as vice president.

Scientific Apparatus Makers Association Meetings:

Aug. 29-Sept. 1—Laboratory Equipment Section, Northernaire Hotel, Three Lakes, Wisconsin.

Oct. 9-12—Recorder-Controller Section, Seaview Country Club, Absecon, N. J.

Oct. 18-19—Industrial Instrument Section, Seaview Country Club, Absecon, N. J.

Nov. 28-30—Laboratory Apparatus; Optical, and Nautical, Aeronautical, and Military Instrument Sections, Hotel New Yorker, New York, N.Y.

May 6-9 1952—Annual Meeting, Edgewater Beach Hotel, Chicago, Illinois.

On Tour: Dr. Maynard A. Joslyn, F.A.I.C., professor, University of California, Berkeley 4, Calif., who is visiting Israel, Switzerland, England, among other countries. In England he will preside at a section meeting of the International Congress of the Institut du Froid, where he will also present a paper.

Moved: Bruce M. Bare, F.A.I.C. chairman of the Chicago AIC Chapter, to Cambridge, Mass., to accept the position of sales manager of the Organic Chemicals Division of Dewey and Almy Chemical Company. He was formerly district manager of Sharples Chemicals, Inc., Chicago.



COUNCIL

OFFICERS

President, Lawrence H. Flett
President-elect, Lincoln T. Work

Secretary, Lloyd Van Doren
Treasurer, Frederick A. Hessel

COUNCILORS

John R. Bowman, *At-Large*
Harry Burrell, *New Jersey Chapter*
Emmett B. Carmichael,
Alabama Chapter
C. C. Concannon, *At-Large*
M. L. Crossley, *At-Large*
Gustav Egloff, *Chicago Chapter*
Gustav Egloff, *Past President*
G. J. Esselen, *At-Large*
M. J. Hiler, *Ohio Chapter*
L. B. Hitchcock, *At-Large*
H. O. Kauffmann, *Niagara Chapter*
M. J. Kelley, *New York Chapter*

R. H. Kienle, *At-Large*
Harold A. Levey, *Louisiana Chapter*
C. P. Neidig, *At-Large*
Donald Price, *At-Large*
Louis N. Markwood
Washington Chapter
Maurice Siegel, *Baltimore Chapter*
M. Sittenfield, *Pennsylvania Chapter*
Foster D. Snell, *Past President*
Raymond Stevens
New England Chapter
Manuel Tubis, *Los Angeles Chapter*
Florence E. Wall, *At-Large*

June Meeting

The 277th meeting of the National Council was held June 13, 1951, at 6:00 p.m. at The Chemists' Club, 50 E. 41st Street, New York, N.Y. President Flett presided.

The following officers and councilors were present: Messrs: J. R. Bowman, C. L. Brown, L. H. Flett, F. A. Hessel, L. Hoyt, M. J. Kelley, M. Sittenfield, L. Van Doren, Miss F. E. Wall, and L. T. Work. K. M. Herstein and V. F. Kimball were present.

The minutes of the previous meeting were accepted.

Mr. Hoyt, as chairman of the Committee on Arrangements for the 1951-52 Annual Meeting, reported that a successful meeting was held on May 9th, 10th, 11th, at Niagara Falls, Ontario, which featured four Symposia, a Panel Discussion, the

Honor Recipients' Luncheon, and the Medal Award to Dr. Harry N. Holmes.

President Flett announced that the regular Committees appointed last year will be continued this year.

He discussed suggested changes to be made in the Constitution and By-Laws, and referred these to the chairman of the Committee on Constitutional Revision.

He announced that additional chapters were considering making special awards similar to the Honor Scrolls of the New York and Chicago Chapters and the Ohio Award.

The Secretary reported that we now have 2496 members. He announced with regret the deaths of the following members: Constant A. Benoit, F.A.I.C., on May 17th; W. A. Bridgeman, F.A.I.C., on December 27, 1950; Edwin S. Cavett, on July 26, 1950; Alvin C. Goetz, F.A.I.C., on March 21st, and Joseph J.

COUNCIL

Stivale, Jr., M.A.I.C., on July 3, 1950.

The report of the Committee on Honorary Membership was presented, and the recommendations for Honorary Membership were approved.

Dr. Work reported for the Committee on Scientific Manpower, which requests that it be continued to stand by, as need for its activities may arise.

President Flett was authorized to appoint Committees for the 1952 Annual Meeting, to be held in the New York area.

A vote of deep appreciation was given to the Niagara Chapter for carrying out the 1951 Annual Meeting so successfully.

Mr. Sittenfield reported that the Pennsylvania Chapter plans four meetings for the coming season; that Student Medal Awards were being presented to outstanding students in that area, and that the Chapter has decided to present an Honor Scroll.

Dr. Brown reported that sixty to eighty per cent of the membership of the New Jersey Chapter had been appointed to active committees. This Chapter is encouraging greater attendance at meetings, and it is also working on a plan to obtain club rooms.

Dr. Kelley reported for the New York Chapter that an extremely successful meeting had been held on May 24th, when Dr. R. E. Kirk received the Honor Scroll and Student Medals were presented. The Chapter voted to charge annual dues of \$2.00 a year to raise more funds for activities. Five meetings are planned for the current year.

Mr. Hoyt reported that the Niagara Chapter had held four meetings this year. At the recent meeting, Student Medals were presented to outstanding students. The Chapter members, in participating in arrangements for the Annual Meeting, especially enjoyed their associations with each other.

Dr. Bowman was introduced as the new Councilor-at-large.

Mr. Neidig reported that he attended one of the recent Luncheon Meetings of the Washington D.C. Chapter, which finds such meetings the most satisfactory way of getting people together.

The following new members were elected:

FELLOWS

Benedict, Joseph T.

Research Associate, Chemistry Dept., Columbia University, New York 27, New York

Dickenson, John IV

Technical Sales Service, Drier-Pigment Dept., The Harshaw Chemical Company, Cleveland 6, Ohio

Germann, Donald Pitt

Chief Chemist & Assistant Secretary, Clark-Cleveland, Inc., 20 Wall Street, Binghamton, New York

Kay, Webster B.

Professor, Ohio State University, Dept. of Chemical Engineering, Columbus, Ohio

Kohr, Donald Alexis, Jr.

Technical Director, Institutional Special Products, The Sherwin-Williams Co., Chicago 28, Illinois

Mead, Marshall Walter

Chief Analyst, Research Dept., Oldbury Electro-Chemical Co., Niagara Falls, New York

Meyer, Jane Dick

Assistant Professor of Chemistry, Seton Hill College, Greensburg, Pa.

Williams, Clyde

Director, Battelle Memorial Institute, 505 King Ave., Columbus, Ohio

Williams, Richard Harold

Washington Representative, Sales Dept., B. F. Goodrich Chemical Co., 1112-19th St., N.W., Washington, D.C.

MEMBERS

Goldfarb, Seymour

Co-owner, O'Brien Salvage Co., 613 W. O'Brien St., Chicago, Ill.

Marcocco, Frank J.

Chemical Engineer, Dept. of Research, U.S. Rubber Reclaiming Co., Inc., 724 Babcock Street, Buffalo, New York

ASSOCIATES

Brach, Agnes Sally

15 Bismarck Avenue, Staten Island 1, New York

Connolly, James Thomas, Jr.

Chemist, Oakite Products, Inc., 22 Thames St., New York 6, N.Y.

Heinzelman, Edward, Jr.

*Chemist, Oakite Products, Inc., 22
Thames St., New York 6, N.Y.*

Meece, Patricia

47 East 48th Street, Bayonne, N.J.

Snipes, Louise J.

*221 South Avenue, Staten Island 3,
New York*

Sweeney, Mary Elizabeth

78 Humphrey Avenue, Bayonne, N. J.

Yandoli, Dolores Jean

1892 Clove Road, Staten Island 4, N.Y.

**RAISED FROM MEMBER
TO FELLOW****Sawyer, Frederick G.**

*Administrator, Air and Water Re-
search, Stanford Research Institute,
Stanford, Calif.*

Honored: John E. McKeen, F.A.I.C., president of Charles Pfizer & Company, Brooklyn, N.Y., pioneer in the mass production of penicillin and terramycin, when he received the honorary degree of Doctor of Engineering from Polytechnic Institute of Brooklyn, on June 13th.

Commemorated: The late William G. Krummrich, vice president of Monsanto, for whom Monsanto's plant at Monsanto, Illinois, was named on April 9th. Dr. Charles Allen Thomas, Hon. AIC, spoke at the memorial ceremonies.

Speaker: Charles C. Concannon, F.A.I.C., of the Chemical Division, National Production Authority, at The Chemists' Club, New York, April 25th, on "Government Control of Chemicals."

Appointed: Walter W. Perkins, as chief ceramic engineer of the U.S. Stoneware Company, Akron, Ohio.

National Council Meetings

Meetings of the AIC National Council will be held at The Chemists' Club, 52 E. 41st Street, New York, N.Y., at 6:00 p.m., on the following dates:

October 10, 1951

November 14, 1951

January 9, 1952

April 9, 1952

Editor: Dr. G. L. Putnam, F.A.I.C., research associate in chemical engineering at the University of Washington, Seattle 5, Washington, who has been appointed editor of *The Puget Sound Chemist*, bulletin of the Puget Sound Section of the American Chemical Society.

To Pakistan: Dr. George Antonoff, F.A.I.C., who has been appointed professor of physical chemistry by the University of the Panjab, Lahore, Pakistan.

To Paris: Dr. Gerald Wendt, F.A.I.C., author and editor, who will be director of public education in the Division of Natural Sciences of UNESCO.

Appointed: By Fisher Scientific Company, Dr. Samuel W. Levine as director of development, to head the newly expanded Development Laboratories of the Company.

AIC Activities

C. P. Neidig, F.A.I.C.

STUDENT MEDALISTS

1951



—Dayton Herald

Malvern J. Hiler, F.A.I.C., presenting a Student Medal Award of the Ohio AIC Chapter to George Omietanski at the Honors Convocation of the University of Dayton.

The above scene is representative of student medal presentations which were made in May and June by seven AIC Chapters to senior chemistry students in their areas, "in recognition of leadership, excellence in scholarship, and character." The students who received awards this year are:

Chicago Chapter

- Harlan J. Anderson
University of South Dakota
- Robert P. Anderson
University of Notre Dame
- William M. Bouska
University of Missouri, School of Mines and Metallurgy
- James Russell Courtright
Bradley University
- John Dahler
University of Wichita
- Dervin L. Flowers
University of Detroit
- Arthur J. Haltner
University of Wisconsin
- Lars Hellberg
Northwestern University
- Paul Delbert Larson
St. Olaf College
- Urho Albert Lehtikainen
Michigan College of Mining & Technology
- Willis Hayden Melgrem
Kansas State College
- Charles J. Norton
Purdue University
- Donald R. Petersen
Lawrence College
- Myron N. Plooster
South Dakota State College
- Charles E. Reeder
Wheaton College
- James Joseph Renier
College of St. Thomas

William M. Rutherford
University of Illinois

Walter H. Seitzer
The University of Chicago

Robert Howard Sherman
Illinois Institute of Technology

Henry C. Terford
Monmouth College

Owen Webster
University of North Dakota

Dale Gordon Williams
Beloit College

Los Angeles Chapter

Sherman A. Boring
Whittier College

James A. Ibers
California Institute of Technology

Andreas Jensen
University of Redlands

William N. McElroy
University of Southern California

Robert Metzenberg
Pomona College

Joseph Shepherd
Loyola University of Los Angeles

New York Chapter

Ruth Cohen
Adelphi College

Lawrence Horowitz
New York University, University Heights

Ruth Horwitz
Brooklyn College

Allen Kropf
Queens College

August H. Maki
Columbia University

Arthur Miller
Polytechnic Institute of B'klyn.

Arthur A. Patchett
Princeton University

Harry Pinch
The City College of New York

Oscar R. Rodig, Jr.
Rutgers University

Malcolm J. Rogers, Jr.
Fordham University

Jerome W. Sidman
New York University, Washington Square

Niagara Chapter

Joseph M. Cahill
Niagara University

Joseph T. Cardone
University of Buffalo

Arthur F. Roaldi
Canisius College

Ohio Chapter

Norman Bates
Western Reserve University

Kenneth J. Bell
Case Institute of Technology

George Omietanski
University of Dayton

AIC ACTIVITIES

Pennsylvania Chapter

Natalie Marilyn Bernstein
Temple University

Joseph A. Feighan
St. Joseph's College

Setha Goodyear
Swarthmore College

Gerhard Maerker
Philadelphia College of Pharmacy & Science

William George Maisch
University of Pennsylvania

Thrygve Richard Meeker
Ursinus College

Barton Milligan
Haverford College

Francis Richard Taylor
LaSalle College

Janice Taylor
Bryn Mawr College

Washington D.C. Chapter

Frank Adrian
The Catholic University of America

Newell Steadman Bowman
The University of Maryland

Thomas Fitzhugh Evans
The University of Virginia

Richard S. Harner
The American University

Oscar Jerome Jackson
Howard University

Thomas Richard Munson
George Washington University

Henry L. Weisbecker
The Georgetown University

Baltimore Chapter

ANNUAL REPORT

1950-51

Our elections were held September 27, 1950, with the following results.

Chairman, H. Walter Kuhl
Vice Chairman, Norris W. Matthews
Secretary-Treasurer,

J. Bernard Edmonds
Representative to National Council,
Maurice Siegel
Reporter to The Chemist,

Ralph W. Lamenzo
Members of Executive Committee:
Albin H. Warth and Marc Darrin

The membership of the Chapter is substantially the same as for the previous year.

We have had several excellent speakers at our lecture meetings, and the interest of the audiences was evidenced by the large number of questions asked during the question and discussion periods which followed the talks. Dr. Raymond M. Burgison, assistant professor of pharmacology, School of Medicine, University of Maryland, spoke on "The Chemotherapy of Infectious Diseases," and Dr. Walter E. Dover, director of entomological research for U.S. Industrial Chemicals, talked on "The Control of Insects around Food Processing Plants."

—H. Walter Kuhl, *Chairman*

Delegate: Dr. George F. Rugar, F.A.I.C., chairman of the Ohio AIC Chapter, when he represented The American Institute of Chemists at the 125th anniversary of Western Reserve University, June 11, 1951.

Successful Start: Made by Harlan J. Anderson, A.A.I.C., 1951 Student Medalist of the Chicago AIC Chapter, when he accepted a position with the General Electric plutonium plant at Hanford, Washington, in May.

Opportunities

Doris Eager, M.A.I.C.

Positions Available

Mechanical engineer: Group leader, designer, high speed automatic machines, supervise machine designers, draftsmen. Industrial machine design. New England. Salary \$7-8,500. Box 81. THE CHEMIST.

Organic chemist: Well trained beginner, or chemist with research experience. Research on synthetic resins, oils gasoline thickeners. New York City. Salary \$300-350. Box 87. THE CHEMIST.

Industrial engineer: Quality control, analysis, evaluation, and interpretation of data and variations. New England. Salary \$7-8,500. Box 83. THE CHEMIST.

Physical chemist: Well trained beginner. New York Laboratory. Salary \$300-350. Box 89. THE CHEMIST.

Process engineer: Evaluation and development of new processes, both inorganic and organic. Middle west. Salary \$7-9000. Box 85. THE CHEMIST.

Physical chemist: Radio-isotopes, radio-active compounds, research experience required. New York City. Salary \$5,000 or better. Box 91. THE CHEMIST.

Inspectors (Chemical), GS-7, \$3825 annum. Appointment of indefinite nature. Pre-requisites are degree in chemistry and one year of practical chemical experience or 3½ years of progressively responsible experience. Must be willing to relocate according to assignment. Those interested should fill out Standard Form 57 "Application for Federal Employment" and return it to the New York Quartermaster Procurement Agency, U. S. Army, 111 East 16th Street, New York 3, N.Y.

Chemical Engineer: Technical administration in New York area, requiring ability to work under pressure, to make sound decisions, and to expedite work under contract. Moderate travel. Prefer man

with process engineering and design experience, two to six years in industry. Give complete details regarding experience, education, references, and salary desired. Reply to Manager of Operations, U.S. Atomic Energy Commission, P.O. Box 30, Ansonia Station, New York 23, N. Y.

Chemists Available

Research Director: F.A.I.C. Ph.D. in organic chemistry. Experience includes over nine years with pharmaceutical concern, started as organic research chemist advanced to assistant director of chemical research; four years with essential oil house, advanced to position as technical director. Currently with bulk chemical manufacturer. Box 80, THE CHEMIST.

Service for Graduates

The Society for Advancement of Management, New York Chapter, has inaugurated a non-profit counseling and placement cooperative for new college graduates in the New York area. The plan includes three sessions, at a nominal fee of \$15, in which the student will be counseled as to the type of employment to seek, how to handle an interview, preparation of resumes, and how to reply to advertisements. Those interested should contact Bernard Haldane, 366 Madison Avenue, New York, N. Y. (Murray Hill 2-8964.)

Instrument Courses: Given by Brown Instruments Division of Minneapolis-Honeywell Regulator Company, at the Brown School of Instrumentation, Philadelphia, Pa., start September 17th.

For Your Library

Outlines of Physical Chemistry

By Farrington Daniels. John Wiley & Sons. 712 pp., 6" x 9". \$5.00.

The addition of nuclear or subatomic phenomena is a new extension in the teaching of physical chemistry. The boundary between nuclear physics and physical chemistry is an artificial one because, after all, any form of energy is still associated with matter in motion. When a change in chemical nature occurs, the physical chemist steps in. This volume covers the conventional field of physical chemistry and extends it to subatomic changes, without neglecting the usual topics.

—Dr. John A. Steffens, F.A.I.C.

Chemical Books Abroad

Rudolph Seiden, F.A.I.C.

Wilhelm Knapp, Halle/Sale: *Techno-Dictionaer*, by Hubert Hermanns, 3rd ed., 461 pp., paper covers, DM 9. A German-English and English-German dictionary of terms employed in metallurgy, including foundry. • *Handbuch der Vacuum-technik*, by E. L. Holland-Merten, 2nd ed., 636 pp., 540 ill. (numbered, not consecutively, from 1 to 2008), 70 tables, paper covers, DM 35. This is an erudite treatise on the theoretical principles of vacuum technique (321 pages) and their practical applications for evaporation, distillation, drying, calcination, cooling, and crystallization, filtration, impregnation, etc.

S. Hirzel, Zuerich: *Poullsson's Lehrbuch der Pharmakologie*, by G. Liljestrang, 16th ed., 673 pp., 57 ill. Here is one of the most famous standard textbooks available on pharmacology, brought up-to-date to include the many progresses made during the last decade. It is organized according to the pharmacological system—organic agents (active after resorption; locally active); inorganic compounds (salts of light metals, etc; heavy metals); ferments and nutrients; hormones and vitamins; antibiotics; antitoxins; etc. • *Darstellung von Hormonpräparaten*, by Erich Vincke, 2nd ed., 171 pp. A discussion of the methods used for the

Available

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92 ORCHARD STREET

Bloomfield, N. J.

preparation of hormonal substances—excluding sex hormones—from glands or by syntheses. Patent and literature sources are considered only until 1943.

Chapman & Hall, London W.C.2: *DDT and Newer Persistent Insecticides*, by T. F. West and G. A. Campbell, 2nd ed., 632 pp., 50 s. The major part of the volume (500 pages) is devoted to DDT, its history, manufacture, and many applications in industry, sanitation, agriculture, and medicine. The new edition includes also a few chapters on other chlorinated insecticides, namely BHC, Chlordane, Toxaphene, and Rhothane.

Duncker & Humblot, Berlin: *Die Haus- und Gesundheitsschädlinge und deren Bekämpfung*, by Heinrich Kemper, 2nd ed., 344 pp., 242 ill., DM 18. For the chemist the most interesting chapter of this book about insect pests and rodents is the one dealing with chemicals used for their destruction. In addition to many older and new insecticides and rodenticides known in America, the author describes a number of preparations not in common use outside of Germany, e.g., Illo and Ventox. Other chapters describe the various insect pests and rodents.

George Thieme, Stuttgart O (Grune & Stratton, N.Y.): *Allgemeine und anorganische Chemie*, by Gerold Schwarzenbach, 4th ed., 474 pp., 107 ill., DM 21.60. Deductive reasoning is used in this textbook of general and inorganic chemistry, which lays emphasis upon modern

atom models and, from them, arrives at an explicitly comprehensible doctrine of valences.

Verlag Chemie, Weinheim/Bergstrasse: *Rost- und Steinschutz in Niederdruck-Anlagen*, by G. Seelmeyer, 1950, 288 pp., 189 ill., DM 12.80. A leading consulting engineer gives complete information on all the causes of corrosion and deposition of boiler scale and their prevention in heating plants (of any size) and hot-water installations. • *Adressbuch deutscher Chemiker 1950/51*, 438 pp., DM 12. An address book of 8000 German chemists. • *Die silicatischen Tonminerale*, by K. Jasmund, 142 pp., 40 ill., paper covers, DM 15.80. All kinds of clay of silicate nature are described and their applicabilities, limitations, structural characteristics, and assay methods discussed, 298 literature sources. • *Organische Peroxyde*, by Walter Eggergluess, 1951, 86 pp., 4 ill., paper covers, DM 9.60. A systematic investigation of 37 organic peroxides according to chromatography, reactions, distribution coefficients, micro-gas analytical determinations, and preparation. Invaluable are the data compiled in the 31 tables of this monograph. • *Die Entwicklung neuer Insectizide auf Grundlage organischer Fluor- und Phosphor-Verbindungen*, by Gerhard Schrader, 1951, 62 pp., paper covers, DM 7.50. A summary of pertinent information about organic F and P compounds used as insecticides, including Bladan, Parathion, Potasan, and Mintacol.

Urban und Schwarzenberg, Munich 22, informs us that the 3rd edition of the famous *Ullmanns Encyclopaedie der technischen Chemie* is now in preparation; 2 or 3 volumes of the 14-volume encyclopedia will be printed annually, starting this year.

Information

Annual Report of the director of Mellon Institute, Dr. E. R. Weidlein, F.A.I.C. The Mellon Institute of Industrial Research, Pittsburgh, Pa.

"New Hunter Goniophotometer." Information sheet. Henry A. Gardner Lab., Inc., 4723 Elm St., Bethesda 14, Maryland.

"Medical X-Ray Protection Up to Two Million Volts." Handbook 41, 49 pp. 15 cents. Superintendent of Documents, U.S. Gov. Printing Office, Washington 25, D.C.

RP1943 "Amides of Glucuronic, Galacturonic, and Mannuronic Acids." 6 pp. 10 cents.

RP1938 "Effect of Boron on the Hardenability of High-Purity Alloys and Commercial Steels." 30 pp. 15 cents.

RP1944 "Absorption Spectra of Methane in the Near Infrared." 7 pp. 10 cents.

RP1941 "Study of the Modifications of Manganese Dioxide." 12 pp. 10 cents.

Order from Supt. of Documents, U.S. Gov. Printing Office, Washington 25, D.C.

"New Price List of Fine Chemicals." Schwarz Laboratories, Inc. 202 East 44th Street, New York 17, N.Y.

"Methods to be Used in the Preparation of Stainless Steel for Hardening." Booklet. C. U. Scott & Son, Inc., Rock Island, Ill.

"Hysol 6000. Thermosetting Plastic Material." Technical bulletin 601. Houghton Laboratories, Inc., Olean, N.Y.

"New Alkyl Phenol, C-9." Technical bulletin. Jefferson Chemical Co., Inc., 711 Fifth Ave., New York, N.Y.

"Graduate Instruction in Ceramics." 10-pp. Department of Metallurgy, Division of Ceramics, Massachusetts Institute of Technology, Cambridge 39, Mass.

"Quod-Pod Support." New laboratory support. Information. Precision Scientific Co., 3737 W. Cortland St., Chicago 47, Illinois.

Discussion on the atomic bomb. "Must We Hide?" By Dr. R. E. Lapp. \$3.00. Addison-Wesley Press, Inc., Cambridge 42, Mass.

A report on a paint remover, which can be sprayed onto a painted surface to speed up the process of removing paint, is available at \$1.75 per copy (PB 97658) from the Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C.

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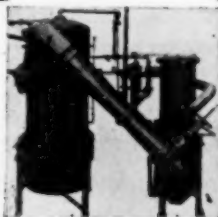
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